Citation:

Pearcey SM, de Castro JM. Food intake and meal patterns of weight-stable and weight-gaining persons. *Am J Clin Nutr.* 2002;76(1):107-112.

PubMed ID: 12081823

Study Design:

Case-control study

Class:

C - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

- To investigate the energy balance during periods of dynamic weight gain through examining short-term food intake, meal patterns, and activity levels of weight-gaining and weight-stable persons.

Inclusion Criteria:

- Subjects must not have been actively dieting, pregnant or lactating, or taking any medication that could influence their eating behavior or metabolism.
- Informed consent

Exclusion Criteria:

- Subjects had been actively dieting, pregnant or lactating, or taking any medication that could influence their eating behavior or metabolism.

Description of Study Protocol:

Recruitment

- 14 men and 24 women were recruited through the research pool at Georgia State University.
- Full-time students received research participation credit, which partially satisfied a course requirement.
- Subjects were asked to draw a graph representing their weight during the past 6 mo. On the basis of this graph, subjects were classified as weight gaining or weight stable.

Design

- Case-control study
- Weight-gaining and weight-stable subjects were matched for sex, height, and weight.

Blinding used (if applicable)

- Not described

Statistical Analysis

- A 2×2 analysis of variance with the factors of sex and weight status was used for the analysis of daily and total intakes.
- No significant interactions were found; therefore, the men and women were combined to form mixed-sex, weight-stable and weight-gaining groups for the meal-pattern analysis.
- t-tests were used to assess differences in meal patterns between the groups.
- Pearson's product-moment correlation coefficients were calculated for each subject individually and transformed into z scores.
- These transformed correlation coefficients were then averaged for both groups.
- t-tests were used to determine differences in these coefficients between the groups.

Data Collection Summary:

Timing of Measurements

- Weight and height were measured with a standard medical scale both before and after the 7-d recording period.
- Subject recorded their hunger, thirst, depression, and anxiety on 7-point Likert scales both before and after each eating episode.
- After completion of the 1-d practice diary, the diary was reviewed by the experimenter. Subjects were instructed to accurately record their food intakes in a 7-d food intake diary.
- Subjects were also instructed to take a picture of their food at the beginning and at the end of each eating episode. The photos were used to verify both the occurrence of meals and the amounts reported in the diaries.
- Subjects completed a 7-page activity diary during the same 7 d as the food intake diary was completed.
- Food intake and activity level were estimated by using established, reliable methods. Authors cited references for the recording procedures and the scale reliability and validity.
- The estimated premeal and postmeal stomach contents were calculated with a computer model in which the reported intake is estimated to empty from the stomach at a rate proportional to the square root of the energy content of the stomach.

Dependent Variables

- Weight gaining: a weight gain of >5% of current body weight during the previous 6 mon, no medical reason for the weight gain (e.g., surgery limiting mobility), and continued weight gain in the month before the study and during the week that they were recording their food intakes.

- Weight stable: a stable weight (i.e. weight fluctuations of <2%) during the previous 6 mon.

Independent Variables

- Total energy, carbohydrate, protein, and fat intakes
- A meal: it must contain ≥209 kJ energy and must be separated in time from the preceding and following ingestive behaviors by ≥15min. More stringent meal definitions of 209 kJ/45 min, 418 kJ/45 min, 836 kJ/45 min, or 209 kJ/90 min were also used.
- Meal frequency, duration of meals
- Meal stomach content
- Self-ratings of hunger, thirst, depression, anxiety, and the attractiveness of the food
- Activity level

Control Variables

- Sex, weight status

Description of Actual Data Sample:

Initial N: not described

Attrition (final N): 19 (7 men; 12 women)

Age: weight-stable group: 25.92±2.18; weight-gain group: 23.17±2.26

Ethnicity: not described

Other relevant demographics: Both groups were matched for gender. There were no significant differences between groups on age.

Anthropometrics: Both groups were matched for height and weight. There were no significant differences between groups on BMI.

Location: Georgia, USA

Summary of Results:

Key Findings

- The weight-gaining group ingested 1645 kJ/d more than did the weight-stable group because of a greater consumption of carbohydrate and fat and larger meal sizes.
- No significant differences in meal frequency, the duration of meals, and the time of day at which meals were initiated, the rate of intake, or the premeal and postal meal intervals were found between the groups.
- No significant differences in pre- and postmeal self-ratings of hunger, thirst, depression, anxiety, or the attractiveness of the food were found between the groups.

• There were no significant group differences in activity estimates based on the activity diary or the activity questionnaire.

• The relation between postmeal palatability ratings and the amount eaten in the meal differed significantly between the groups ($P<0.05$). In the weight-stable group, the slope of the regression suggests that for each increase of 481 kJ in meal size, there was a one-unit increase in the postmeal palatability rating; however, in the weight-gaining group the slope of the regression was not significantly different from zero.

Author Conclusion:

• The greater food intake in the weight-gaining group did not result from environmental, social, or psychological factors, suggesting that the overeating associated with weight gain might be physiologically based.

Reviewer Comments:

Strengths

• *Measurements of food intakes and activity levels were described adequately and were based on standard, valid and reliable data collection procedures and instruments.*

• *Adjustments in statistical analysis were made to ensure groups were comparable on important confounding factors.*

• *Study limitations (e.g., underestimated intakes, overestimated weight gain) were identified and discussed.*

• *The conclusion was supported by results with limitations taken into consideration.*

Limitations

• *Sample size was relatively small in this study, and a statistical power was not calculated. Thus, it was unclear whether statistical power was adequate to detect group differences.*

• *Withdrawals and methods of handling withdrawals were not described.*

• *It was unclear if blinding was used for experimenters and subjects to prevent introduction of bias.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes

3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	No
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A

3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	No
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	No
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	No
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	No
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A

6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes

10.1.	Were sources of funding and investigators' affiliations described?	No
10.2.	Was the study free from apparent conflict of interest?	Yes